



Department of Toxic Substances Control



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AR_N00236_003095
ALAMEDA POINT
SSIC NO. 5090.3.A

March 29, 2003

Mr. Andrew Dick
Department of Navy
Southwest Division
Naval Facilities Engineering Command
1230 Columbia Street, Suite 1100
San Diego, CA 92101

DRAFT REMEDIAL INVESTIGATION REPORT, SEAPLANE LAGOON, OPERABLE UNIT 4B, SITE 17, ALAMEDA POINT, ALAMEDA, CALIFORNIA

Dear Mr. Dick:

The Department of Toxic Substances Control (DTSC) has reviewed the above referenced document dated January 28, 2003. We appreciate the level of effort the Navy has applied in completing this report. Attached are our comments.

Please note that the overall sufficiency of site characterization and human health risk assessment with respect to the releases of radioisotopes to the seaplane lagoon will be determined by the California Department of Health Services (DHS). Please provide the DHS with a copy of the report and include DHS in any future submittal of documents concerning radiological issues. Should you have any questions, please call me at (510) 540-3767.

Sincerely,

Marcia Y. Liao

Marcia Liao, Ph.D., CHMM
Hazardous Substances Engineer
Office of Military Facilities

enclosure

cc: (see next page)

California Environmental Protection Agency
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Mr. Andrew Dick
Page 2
March 29, 2003

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MEMORANDUM

TO: Marcia Liao, Project Manager
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FROM: James M. Polisini, Ph.D.
Staff Toxicologist
Human and Ecological Risk Division (HERD)

DATE: March 5, 2003

SUBJECT: ALAMEDA POINT (NAVAL AIR STATION ALAMEDA)
DRAFT SEAPLANE LAGOON REMEDIAL INVESTIATION (RI)
REPORT
[PCA 18040 SITE 201208-00 H:64]

Background

HERD has reviewed the document titled *Draft Remedial Investigation Report Seaplane Lagoon, Alameda Point, California*, dated January 28, 2003. This draft report was prepared for Southwest Division, Naval Facilities Engineering Command, by Battelle of Duxbury, Massachusetts, Entrix, Inc. of Walnut Creek, California and Neptune & Company of Los Alamos, New Mexico.

This Draft RI Report presents investigations performed at the Seaplane Lagoon (SPL) contained in reports dating from 1993 through 2001. HERD has been involved in the investigation of the SPL since 1991, when the initial Ecological Risk Assessment (ERA) Work Plan was developed for the SPL.

Naval Air Station (NAS) Alameda, also known as Alameda Point, is located on the western end of Alameda Island, on the eastern side of San Francisco Bay, adjacent to the city of Oakland. NAS Alameda occupies approximately 1734 acres of land. A portion of NAS Alameda was originally a peninsula used for agricultural purposes prior to development as an industrial, ferry and transit center in the 1800s. In 1936 the Navy acquired the property from the Army and began construction of NAS Alameda for support of aviation. The SPL is located on the southeastern corner of NAS Alameda with Piers 1, 2, and 3 outside the SPL southern boundary. The SPL was constructed of an area which was originally tidal flat and occupies and interior area of approximately 110 acres.



General Comments

HERD appreciates the level of effort the Navy and Navy contractors have applied in compiling and analyzing the data available for the SPL. All indications are that: 1) a release to the environment has occurred during the Navy use of this property; 2) there is some degree of human health risk and some degree of ecological hazard associated with these releases, and; 3) contamination appears to drop considerably at the Merritt Sand horizon. The sole remaining issue is to identify the lateral and vertical extent of the area of SPL which must proceed to consideration of remedial alternatives in the Feasibility Study (FS). This comment is intended for the DTSC Project Manager and no response is required from the Navy.

Specific Comments

1. The area in the southwest corner of the SPL, adjacent to the SPL entrance, and indicated as 'Spoils?' (Figure 2-4, page 10) should be considered for inclusion in the FS determination of lateral and vertical sediment concentrations. There are few samples taken from this area in comparison to the outfalls in the northwestern and northeastern corners of the SPL. Remediation to the depth of the Merritt Sand might address this potential issue without requiring further sampling.
2. HERD participated in a day-long meeting regarding the development of the exposure parameters for the human health risk assessment (HHRA) for construction workers removing the piping leading from the Building 5 and Building 400 to the SPL (Section 2.3.1.1, page 12). The indication in this RI Report, regarding a removal action, is the first time HERD has heard of the removal action. HERD did not review and approve of the final exposure parameters for the construction worker scenario prior to this removal action.
3. HERD suggests that the reference to 'various flatfish' (Section 2.3.3, page 16) should be expanded to include the fact that white croaker, the benthic fish most likely to accumulate lipophilic compounds to high concentrations and consumed by fishers, was collected in the fish trawling.
4. HERD would agree that it was necessary to 'dilute' the sediment samples in the consortium studies performed by the University of Berkeley, Lawrence Livermore National Laboratory and Lawrence National Laboratory (BERC) sediment samples from the SPL 1:6 in order to perform the *Macoma nasuta* bioaccumulation studies without direct mortality (Section 2.4.3.2, page 25). This is a further indication that the sediments at depth in the northwestern and northeastern corners of the SPL are candidates for inclusion in the FS.
5. U.S. EPA Region 10 has indicated that sediment concentrations of tributyl tin (TBT) are not accurate indicators of ecological hazard (U.S.EPA, 1996) and that pore water concentrations of TBT are more accurate indicators of ecological hazard. Please determine whether excluding TBT sediment concentrations from the development of the Effects Range Median (ER-M) hazard quotient (ERM-Q) decreases the variability due to TBT concentrations

and increase the predictive power of this modified ERM-Q (Section 3.1.1, page 29). A summary statement of the Region 10 TBT report contained in the Contaminated Sediments News number 18, (<http://www.epa.gov/waterscience/pc/csnews/csnews18.html>) states: "Results of Region 10's study suggest that bulk sediment, and organic carbon-normalized sediment TBT concentrations may be poor predictors of the bioavailable fraction of TBT. Thus, Region 10 strongly recommends that sediment cleanup decisions at Superfund sites in Puget Sound be based on TBT concentrations in interstitial water, and on any associated biological effects testing." HERD contacted Karen Keeley, the EPA Region 10 contact for the TBT report, and was told that the TBT report contained no ER-M value for TBT in bulk sediment and that EPA Region 10 screens sediment TBT based on a range of TBT in pore water concentration of 0.05 µg/l (as TBT ion) to 0.15 µg/l as TBT ion. These recommendations are contained in the report titled *Recommendations for Screening Values for Tributyltin in Sediments at Superfund Sites in Puget Sound, Washington* (EPA 1996). HERD EcNOTE number 2 should be consulted for guidance regarding a Toxicity Equivalency Factor (TEF) approach for organotin compounds.

6. HERD agrees that with the possible exception of antimony and mercury, other inorganic elements are elevated in the northeastern and northwestern corners of the SLP (Section 3.2, page 32). Representatives of HERD, the U.S. EPA and the San Francisco Regional Water Quality Control Board (SFRWQCB) expressed this opinion directly to Navy staff at least 6 years ago. This comment is intended for the DTSC Project Manager and no response is required from the Navy.
7. The proposed FS footprint (Figure 7-15, page 236) does not include all areas of elevated chemical concentrations. For example, sediment cadmium concentrations in the 0.3 foot to 2 foot depth (Figure 3-5, page 39) near the northwest outfall appear elevated, but do not appear to be included in the proposed remedial evaluation area outlined for cadmium. Remediation of this expanded area near the northwest outfall to 5 feet would appear to capture all the sediment with elevated cadmium concentrations.
8. The sediment concentrations of total polychlorinated biphenyls (PCBs) in surface sediments (i.e., 0 to 0.3 feet) also appear to be elevated along the western boundary and eastern boundary of the SPL in areas not included in the proposed FS footprint (Figure 7-15, page 236). The proposed FS footprint may need to be expanded to include these areas. Remediation to 5 feet would appear to remove elevated SPL PCB concentrations (Figure 3-19, page 51).
9. The proposed FS footprint (Figure 7-15, page 236) clearly does not include all the areas of elevated radium (²²⁶Ra) concentrations particularly at the surface (Figure 3-20, page 52) or at depth (e.g., Figure 3-21, page 53 and Figure 3-22, page 54). These are clearly releases from Navy activities (Section 5.1.4, page 123) which must be addressed in the FS. The California Department of Health Services should be contacted to consult on any proposed remedial action area for ²²⁶Ra and daughter products.

Consideration of Remedial Alternatives for sediment ^{226}Ra may require consideration of depths greater than 5 feet (Figure 3-23, page 55). This comment is intended for the DTSC Project Manager and no response is required from the Navy.

10. Organic compounds (e.g., pesticides, polychlorinated biphenyls [PCBs] and polycyclic aromatic hydrocarbons [PAHs]) in SPL forage fish are at concentrations 'clearly...higher' than the forage fish tissue concentrations at the reference stations (Section 4.2.3, page 87). Particular attention should be paid to these organic compounds when determining the lateral and vertical extent for inclusion in the FS as these are compounds which will greatly influence the human health risk, via the fish/shellfish ingestion pathway, as well as the upper trophic level ecological hazard. This comment is intended for the DTSC Project Manager and no response is required from the Navy.
11. Tissue concentrations of silver in *Macoma nasuta* are elevated above reference stations (Figure 4-1, page 88). The maximum silver tissue concentration in forage fish is in the less than ten cm size class for the three groups of perch, sanddab & sole and gobies & sculpin (Figure 4-15, page 102) and appear to be approximately double the maximum silver tissue concentration at the reference areas. These are clear indications of a release of silver to the SPL and silver should enter into the development of the remedial footprint.
12. The tissue samples from perch of less than 10 cm length appear to be consistently higher, as a group, for organic compounds than other forage fish (e.g., Figure 4-17, page 104 and Figure 4-18, page 105). HERD has reviewed the Appendices but cannot locate the specific criteria used to develop the forage fish concentration for upper trophic level consumers.
13. It is interesting that tidal action is identified as the cause of rapid dilution and/or transport of constituents out of the SPL (Section 5.1.1.2, page 117). Previously the Navy had argued that wind-driven wave action was responsible for transporting contaminants into the SPL from San Francisco Bay. This comment is intended for the DTSC Project Manager and no response is required from the Navy.
14. Please state how the accumulated data on the California least tern at NAS Alameda collected 'since 1993' compare to the statewide average of 0.7 young-per-nest (Section 5.1.3.1, page 120) in the discussion of potential ecological hazard to the California least tern.
15. Please amend the text to indicate that a conservative estimate of ecological hazard was performed to be protective, rather than indicating there was '...an overestimation of risk.' (Section 5.1.3.2, page 121).
16. It does not seem reasonable that a juvenile least tern ingestion rate relative to body weight is lower than that for adult (Section 5.1.3.4, page 123). Least terns grow from an approximate hatch weight of 5 grams to an approximate fledge weight of 40 grams (OEHHA CalECOTOX database,

http://www.oehha.org/cal_ecotox/report/sternef.pdf) in a span of 20 days. If the ingestion rate for juvenile terns was estimated based on a regression of ingestion rates utilizing mostly adult birds, this could seriously underestimate juvenile ingestion rates and lead to an underestimation of intake and hazard. Please clearly identify in the text the method used to develop the juvenile ingestion rate.

17. The summary of potential effects on benthic organisms makes no mention of the failed *Macoma nasuta* bioassays conducted by the University of California Berkeley in their study of the SPL mentioned earlier (Section 2.4.3.2, page 25). *Macoma nasuta* died when exposed to SPL sediments from some locations during bioaccumulation testing. SPL sediments from these locations had to be mixed with 'clean' sediments in a 1:6 ratio of SPL to 'clean' so that the bioaccumulation testing could proceed. This result does not indicate 'low potential for risk to the benthic community' as stated (Section 5.2.2.1, page 129, Summary). Please include the results of these U.C. Berkeley *Macoma nasuta* tests and revise the summary to indicate that there were adverse effects in some tests of benthic organisms where mortality would not be the normal toxic endpoint.
18. HERD agrees that the results of the Weight of Evidence (WOE) approach '...do not provide a clear definition of the FS footprint related to ecological risk.' (Section 5.2.3, page 135).
19. Exposure parameters for ecological receptors (Table 5-2, page 149) were checked at random and found to be arithmetically correct. This comment is intended for the DTSC Project Manager and no response is required from the Navy.
20. Ecological hazard associated with some elements and compounds is not evaluated as indicated by a 'NA' in the Toxicity Reference Value (TRV) tables (Tables 5-3 through 5-16). HERD identified potential avian TRVs for these elements and compounds in an extremely short search of internet sources (Appendix A of this memorandum). These TRV values should be used for elements and compounds currently listed as NA.
21. Hazard Quotients (Table 5-23 through 5-29) were checked at random and found to be arithmetically correct.
22. The 'surface sediments' of SPL (Section 7.0, page 207) are not the only sediments which must be considered for potential remedial action. There is ample evidence that some benthic invertebrates access sediments at least 2 feet below the sediment water interface. Remedial measures must be sufficient to sever potential exposure pathways clearly present by this bioturbation. Consideration of any remedial alternative in the Feasibility Study (FS) for SPL must address contamination at depth.
23. The WOE approach cannot be 'not intended to be prescriptive' (Section 5.2.3, page 135) yet used to 'identify stations clearly requiring inclusion in the remedial footprint' (Section 7.1, page 207). HERD agrees that the results of

the WOE approach were inconclusive and each line of evidence requires best scientific judgment evaluation regarding ecological hazard.

24. A geometric mean of No Observable Effect Level (NOEL) tissue concentrations (Section 7.1.2, page 208) is not necessarily protective of the most sensitive receptor utilizing the SPL. For example, the geometric mean NOEL dry weight tissue cadmium concentration of 5.41 mg/kg is approximately 100 times the lowest NOEL dry weight tissue concentration of 0.06 mg/kg (Table 7-1, page 209). Use of the lowest NOEL would yield a cadmium sediment concentration of 0.24 mg/kg using the methodology presented in this document.
25. U.S. EPA guidance for risk management requires that decisions on remedial goals be made on the Reasonable Maximum Exposure (RME), not a median value (Section 7.2.1, page 232). The preamble to the Superfund regulation states that EPA will use reasonable maximum exposure (RME) values and assumptions in its risk assessments and that RME estimates will provide the basis for the development of protective exposure levels for future use (National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule, 40 CFR part 300).
26. Surface sediments (i.e., zero to 0.3 feet below the sediment water interface) are not the sole unit of sediment requiring evaluation of remedial alternatives (Section 7.3, page 235). Other sediment levels have elevated concentrations of various contaminants which must be considered in the evaluation of remedial alternatives where there is a potentially complete exposure pathway. Please see comment 22 above.
27. Approximately 2 years ago HERD recommended an ERM Quotient (ERM-Q) sediment criterion of 0.62 be used to outline the surface sediment locations which would proceed to the FS, based on data presented by the Navy in a meeting at the ENTRIX headquarters in Walnut Creek, CA. Please identify the ERM-Q value of 0.62 in any future figures of proposed remedial footprints for surface sediments.
28. HERD would agree that the fish and/or shellfish consumption rates contained in the San Francisco Estuary Institute (SFEI, 2002) report are an appropriate source for local general fish/shellfish consumption rates. However, the shellfish/fish consumer rate as contained in the document titled *Seafood Consumption Survey of the Laotian Community of West Contra Costa County, CA, Asian Pacific Environmental Network, March 1998* appear to be the most relevant fish/shellfish consumption rates for sensitive subpopulations in the San Francisco Bay area. Please add an assessment for sensitive subpopulations of fishers using the 1998 data.
29. HERD agrees that for some contaminants, SPL forage fish tissue concentrations are below those measured at Hunters Point Shipyard (HPS) (Section 6.1, page 185). These figures for four contaminants (Figure 6-1 through 6-4) demonstrate that the fish tissue concentrations at HPS are

elevated relative to other locations in the Bay. The potential hazard associated with these sediments at HPS is currently under discussion between regulatory agencies, resource trustees and the Navy. This comment is intended for the DTSC Project Manager and no response is required from the Navy.

30. Please provide a short summary of the results of the human health risk assessment (HHRA) for children exposed via ingestion of fish and direct contact with sediment in the text rather than referring to Appendix F.2 (Section 6.2.1, page 190). This could most easily be performed by presenting a table of the results contained in Appendix F.
31. Please provide a reference to the Chebyshev inequality procedure for those data with 'large' lognormal variances (Section 6.2.2, page 191).
32. The Dermal Absorption Factor (DAF) listed for the EPA Region 9 Preliminary Remediation Goals (PRGs) table is not 0.001 for metals. The organic compounds (Section 6.2.3, page 196) DAF of 0.1 is correct for the U.S. EPA PRG table, however HERD recommends the DAF values contained in the DTSC Preliminary Endangerment Assessment (PEA) manual for inorganic and organic compounds. Some of the DAF values for inorganic elements and organic compounds differ from those used in this HHRA assessment, which would have an impact on the statement that '...in all cases, the difference between the two analyses is related to the cancer slope factors employed' (Section 6.3, page 196). The differences in PEA DAFs versus the U.S. EPA PRG values could also influence the significance of the HHRA results in outlining the proposed FS footprint, particularly for PCBs. Revised HHRA results, based on the PEA manual DAF values, should be submitted prior to consideration of the proposed FS footprint.
33. The Office of Environmental Hazard Assessment (OEHHA) cancer slope factors (Table 6-3, page 197) were checked at random and found to be accurate. This comment is intended for the DTSC Project Manager and no response is required from the Navy.
34. HERD defers to the U.S. EPA Region 9 and the California Department of Health Services regarding the overall sufficiency of the assessment of the human health risk due to Navy releases of radioisotopes to the SPL (Section 6.3, page 196 and Section 6.4.2, page 201). However, HERD has some methodological comments as indicated below.
35. The difference between the non-cancer hazard for both the RME scenario and the Central Tendency Exposure (CTE) scenario for summed consumption of fish and shellfish (Table 6-5a, page 200) indicates that the difference between non-cancer hazard at reference stations and the SPL stations is approximately 13. This would indicate a significant non-cancer hazard based solely on this exposure pathway. Please explain more fully how these hazard quotients (HQs) do not enter more fully into the proposed FS footprint.

36. Any criteria developed in the Uranium Mine Tailings Radiation Control Act (UMTRCA) (Section 6.4.2, page 201) are not applicable to NAS Alameda. This Navy base was not the site of a uranium mine. HERD supports the U.S. EPA guidance of 15 mrem/year for Superfund Sites. It has not been HERD's experience that 'protective' exposures under the UMTRCA are less than those specified by the U.S. EPA for exposures under a residential scenario (OSWER, 1997). In addition, please provide the documentation and citation for stating that the 'background' at NAS Alameda is 5 picoCuries/g (pCi/g) (Section 6.4.2, page 201).
37. The assessment of the human health risk appears to separate incremental cancer risk from exposure to radiation from incremental cancer risk associated with exposure to chemicals at the site (Section 6.4.3, page 202). This is counter to U.S. EPA Superfund guidance which clearly states that incremental cancer risk from both direct exposure to radiation and exposure to chemicals must be summed. There are obvious patterns of release of radioisotopes in the SPL in surface sediments (Figure 3-20, page 52) and at depth (Figure 3-21, page 53 and Figure 3-22, page 54). Please present and identify, in the text, the table presenting the cumulative risk from exposure to chemicals and radioisotopes as required (OSWER, 1997).
38. A tabular presentation of 'risk drivers' is presented only for the CTE scenario. Please provide a table outlining the 'risk drivers' under the RME scenario in addition to the CTE scenario listed (Tables 6-8a through 6-9b.).
39. Please explain the rationale for not including the results of the Benthic Flux Sampling Device (BFSD) regarding efflux of inorganic elements from the sediment into the definition of the proposed Remedial Action Objective (RAO), specifically for cadmium. The cadmium flux from the sediments, relative to other areas of the SPL (Appendix B of this memorandum) and San Francisco Bay, should be indicated on the figure presenting the proposed footprint of RAOs, especially in the northwest corner of the SPL where cadmium is a risk driver.
40. The results of the Acoustic Imaging of the SPL performed by the University of California Berkeley BERC in the 1997 study of the SPL should be consulted when evaluating the proposed volume subject to remedial alternatives. This study showed that the thickness of recent deposits ranged from 0 to 7 feet with the thickness of the recent deposits increased to the west across the SPL. This comment is intended for the DTSC Project Manager and no response is required from the Navy.

Conclusions

This document presents data collected over ten years of investigation indicating the obvious past release of contaminants due to Navy activities at NAS Alameda. The only issue to resolve is the lateral and vertical extent of the area of the SPL to proceed to the FS. HERD does not agree with the sediment concentrations proposed for the lateral area to be included in the FS in Figure 7-15 and recommends that sediments with 24.4 mg/kg cadmium not remain in SPL. The

vertical distribution of the sediment concentration finally agreed upon for the FS must be evaluated for those sediments which will be potentially exposed by any remedial action or bioturbation. This would appear to require additional vertical sampling unless the Navy is prepared to address remediation to the Merritt Sand.

The disagreement regarding the proposed RAOs must be resolved prior to development of the FS.

References

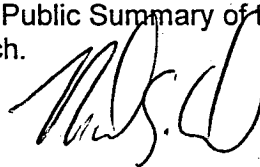
Federal Register Vol. 55, No. 46, pg. 8712, March 8, 1990. National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule, 40 CFR part 300.

Office of Solid Waste and Emergency Response (OSWER). 1997. Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination. OSWER No. 9200.4-18. August 22, 1997.

Recommendations for Screening Values for Tributyltin in Sediments at Superfund Sites in Puget Sound, Washington (EPA 1996).

San Francisco Estuary Institute. 2002. Public Summary of the San Francisco Bay Seafood Consumption Study. March.

Reviewed by: Michael Anderson, Ph.D.
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Appendix A – Additional Toxicity Reference Values

Toxicity (LC50) values for birds as mg/kg diet ranged from 170 to 858 in studies where chlordane was given for between 5 days and 100 weeks, (Environmental Health Criteria 34. WHO, 1984).
<http://pops.gpa.unep.org/13chlo.htm>

Effects on birds: Chlordane is moderately to slightly toxic to birds. The LD50 in bobwhite quail is 83 mg/kg. The 8-day dietary LC50 for chlordane is 858 ppm in mallard ducks, 331 ppm in bobwhite quail, and 430 ppm in pheasant [9,26]. <http://ace.ace.orst.edu/info/extoxnet/pips/chlordan.htm>

Chlordane is highly toxic to birds. The LD50 for bobwhite quail is 83 mg/kg. The 8-day dietary LD50 for chlordane in mallard ducks is 858 ppm of the diet, 331 ppm in bobwhite quail, and 430 ppm in pheasant (2, 18, Lethal Diet Tox. Environ Poll. Birds. 1975). <http://pmep.cce.cornell.edu/profiles/extoxnet/carbaryl-dicrotophos/chlordane-ext.html>

NOAEL and LOAEL data, found in "Toxicological Benchmarks for Wildlife", by B. E. Sample, et al, for the Department of Energy, 1996:

Animal Studied: Red-Windged Blackbird

Definitions:

NOAEL = "No Observed Adverse Effects Level"

LOAEL = "Lowest Observed Adverse Effects Level"

mg/kg/d = milligram/kilogram/diet weight

[Quote]

While 26% and 24% mortality was observed among birds on diets containing 50 and 100 mg/kg Chlordane, no adverse effects were observed among the 10 mg/kg dose group.

Because the study considered exposure over 84 days, the 10 mg/kg dose was considered to be a chronic NOAEL. The 50 mg/kg dose was considered to be a chronic LOAEL.

Final NOAEL: 2.14 mg/kg/d

Final LOAEL: 10.7 mg/kg/d

[EndQuote] <http://www.geocities.com/noxot/year2000/avdieoff.htm>

Table 3. Toxicity Reference Values for Birds

Constituent Test Species, NOAEL (mg/kg-d), LOAEL (mg/kg-d), Reference
Inorganics

| COPEC | Test Organism | | NOAEL (mg/kg-d) | LOAEL (mg/kg-d) | Footnote Reference |
|-----------|---------------|-------------|--------------------|--------------------|-----------------------|
| Aluminum, | Ringed | dove, | 1.10E+02, | 1.10E+03, | b |
| Arsenic | Mallard | duck | 5.14E-00 | 1.28E+01 | a |
| Barium | Chick | (1-day old) | 2.08E+01 | 4.17E+01 | f |
| Boron | Mallard | duck | 2.88E+01 | 1.00E+02 | a |
| Cadmium | Mallard | duck | 1.45E-00 | 2.00E+01 | a |
| Chromium | Black | duck | 1.00E-00 | 5.00E-00 | a |
| Copper | Chick | (1-day old) | 4.70E+01 | 6.17E+01 | A |
| Fluoride | Screech | owl | 7.80E-00 | 3.20E+01 | a |
| Lead | Japanese | quail | 1.13E-00 | 1.13E+01 | a |
| Manganese | Japanese | quail | 9.97E+02 | 9.77E+03 | b |

| | | | | | |
|------------|---------------|----------|----------|----------|---|
| Mercury | Japanese | quail | 4.50E-01 | 9.00E-01 | a |
| Molybdenum | Chicken | 3.50E-00 | 3.53E+01 | c | |
| Nickel | Mallard | duckling | 7.74E+01 | 1.07E+02 | a |
| Selenium | Mallard | duck | 5.00E-01 | 1.00E-00 | a |
| Tin | Japanese | quail | 6.80E+00 | 1.69E+01 | a |
| Uranium | Black | duck | 1.60E+01 | 1.60E+02 | d |
| Vanadium | Mallard | duck | 1.14E+01 | 1.14E+02 | b |
| Zinc | White Leghorn | chicken | 1.45E+01 | 1.31E+02 | a |
| | | | | | |

Organics

| COPEC | Test Organism | NOAEL (mg/kg-d) | LOAEL (mg/kg-d) | Footnote Reference |
|----------------------------|---------------|-----------------|-----------------|--------------------|
| Bis(2-ethylhexyl)phthalate | Ringed dove | 1.10E-00 | 1.10E+01 | b |
| 1,2-Dichloroethane | Chicken | 1.72E+01 | 3.44E+01 | a |
| Di-n-butyl phthalate | Ringed Dove | 1.10E-01 | 1.10E-00 | a |
| Pentachloronitrobenzene | Chicken | 7.07E-00 | 7.07E+01 | a |
| Toxaphene | Black Ducks | 2.00E-00 | 1.00E+01 | g |

PCBs and Pesticides

| COPEC | Test Organism | NOAEL (mg/kg-d) | LOAEL (mg/kg-d) | Footnote Reference |
|--------------------------------------|----------------------|-----------------|-----------------|--------------------|
| Aroclor 1242 | Screech-owl | 4.10E-01 | 4.10E-00 | b |
| Aroclor 1254 | Ring-necked pheasant | 1.80E-01 | 1.80E-00 | c |
| Benzene-Hexachloride-(mixed isomers) | Japanese Quail | 5.60E-01 | 2.25E+01 | a |
| Chlordane | Red-winged blackbird | 2.14E-00 | 1.07E+01 | a |

| | | | | |
|---------------------|----------------|----------|----------|---|
| DDT and metabolites | Brown pelican | 2.80E-03 | 2.80E-02 | c |
| Dieldrin | Barn owl | 7.70E-02 | 7.70E-01 | b |
| Endosulfan | Gray partridge | 1.00E+01 | 1.00E+02 | b |
| Endrin | Screech owl | 1.00E-02 | 1.00E-01 | c |
| Lindane | Mallard duck | 2.00E-00 | 2.00E+01 | c |
| | | | | |

Dioxins/Furans

| COPEC | Test Organism | NOAEL (mg/kg-d) | LOAEL (mg/kg-d) | Footnote Reference |
|---------------------------------|----------------------|-----------------|-----------------|--------------------|
| 2,3,7,8-TCDD | Ring-necked pheasant | 1.40E-05 | 1.40E-04 | a |
| 2,3,7,8-Tetrachlorodibenzofuran | Chick | 1.00E-06 | 1.00E-05 | e |

TRV = toxicity reference value

a Sample et al. (1996).

b Sample et al. (1996); LOAEL derived from NOAEL.

c Sample et al. (1996); NOAEL derived from LOAEL.

d Sample et al. (1996); LOAEL derived from subchronic NOAEL.

e Sample et al. (1996); LOAEL derived from subchronic LOAEL.

f Sample et al. (1996); NOAEL and LOAEL derived from subchronic NOAEL and LOAEL, respectively.

g Mehrle et al., 1979.

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Terrestrial Toxicity Reference Values (TRVs) P.7.3

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<http://www.srs.gov/general/enviro/erd/ffa/rdh/p73.PDF>

Appendix B: Results of the sediment to water flux of Cadmium detected by SPAWAR San Diego using the Benthic Flux Sampling Device in the Seaplane Lagoon, NAS Alameda.

Cadmium

Cadmium fluxes were negative at SL10 and positive at SL2, SL5 and SL7. The highest positive flux was $125 \mu\text{g}/\text{m}^2/\text{day}$ at SL7. Cadmium fluxes at SL2, SL5 and SL7 were statistically distinguishable from the blank with $p < 0.01$. The cadmium flux at SL10 was not statistically different from the blank. Time-series plots for Cadmium concentrations in the flux chamber at the four Seaplane Lagoon stations are shown in Figure 5.

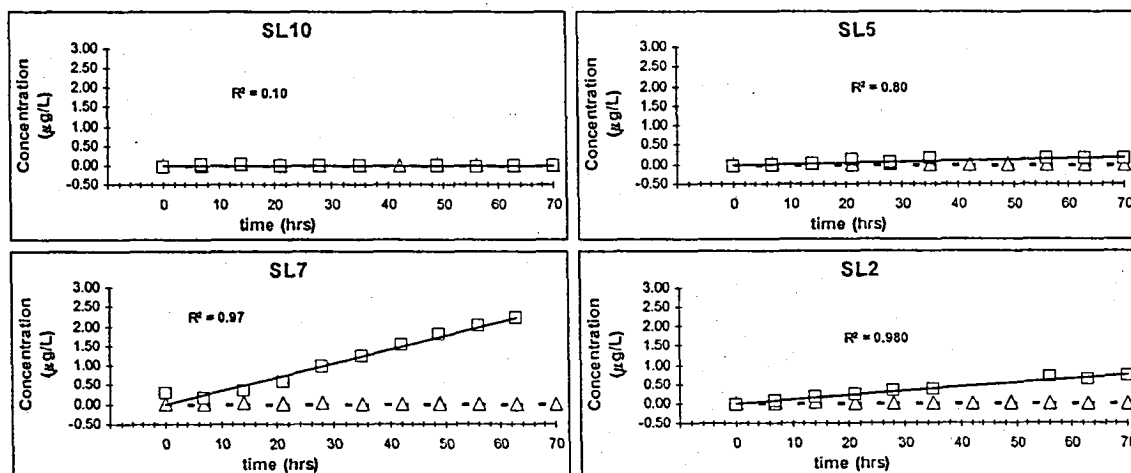


Figure 1. Time-series plots for Cadmium in the BFSB chambers. Red squares indicate concentrations for station samples, and blue triangles indicate blank chamber concentrations. Best-fit linear-regression lines are also shown.